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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1. (Original) A method for assessing brain state by analysing mammalian brain electroencephalogram (EEG) recordings using an eighth order autoregressive and fifth order moving average discrete time equation.

Claim 2. (Original) A method as claimed in claim 1, further including the steps of:

taking a z-transform for said eighth order autoregressive and fifth order moving average discrete time equation to obtain a z-domain equation, determining poles and zeroes in the solution of the z-domain equation; and

plotting the poles onto the complex plane.

Claim 3. (Original) A method of assessing the state of a mammalian brain including the steps of:

(i) obtaining an electroencephalogram (EEG) from the brain;

(ii) digitising the EEG to define a digitised EEG data signal;

(iii) segmenting the EEG data signal into time frames of fixed length, y[n];

(iv) approximating each digitised time frame by a first equation:

$$y[n] = -\sum_{k=1}^{8} a_k y[n-k] + \sum_{k=0}^{5} b_k u[n-k]$$

(v) solving the first equation to determine coefficients a_1 to a_8 and b_0 to b_5;

(vi) performing a z-transform on the first equation to obtain a second, z-domain equation:

$$Y(z) = \frac{\sum_{k=0}^{5} b_k z^{-k}}{1 + \sum_{k=1}^{8} a_k z^{-k}} U(z) = \frac{B(z)}{A(z)} U(z)$$

(vii) substituting each of the values of the coefficients into the z-domain equation;

(viii) solving A(z) = 0 for z in the second equation to determine the poles;

(ix) plotting the poles in the complex plane;

(x) repeating steps (iv) to (ix) for each frame in the sample to determine clusters of poles in the complex plane; and

(xi) assessing the state of the brain by reference to the position and distribution of at least some of said clusters of poles as mapped in the complex plane.

Claim 4. (Original) A method of assessing the state of a mammalian brain including the steps of:

(i) obtaining an electroencephalogram (EEG) from the brain;

(ii) digitising the EEG to define a digitised EEG data signal;

(iii) segmenting the EEG data signal into time frames of fixed length, y[n];

(iv) approximating each digitised time frame by a first equation:

$$y[n] = -\sum_{k=1}^{8} a_k y[n-k] + \sum_{k=0}^{5} b_k u[n-k]$$

(v) solving the first equation to determine coefficients a_1 to a_8 and b_0 to b_5;

(vi) performing a z-transform on the first equation to obtain a second, z-domain equation:

$$Y(z) = \frac{\sum_{k=0}^{5} b_k z^{-k}}{1 + \sum_{k=1}^{8} a_k z^{-k}} U(z) = \frac{B(z)}{A(z)} U(z)$$

(vii) substituting each of the values of the coefficients into the z-domain equation;

(viii) solving A(z) = 0 for z in the second equation to determine the poles;

(ix) plotting the poles in the complex plane;

(x) repeating steps (iv) to (ix) for each frame in the sample to determine clusters of poles in the complex plane; and

(xi) administering an intervention to the brain;

(xii) repeating steps (i) to (x) at least once;

(xiii) monitoring movement of at least some of said clusters of poles in the complex plane; and

(xiv) assessing the state of the brain by reference to movement of at least some of said clusters of poles as mapped in the complex plane.

Claim 5. (Currently amended) A method as claimed in claim 3 ~~or 4~~ including the step of filtering the EEG to remove noise signals therefrom prior to carrying out step (iii).

Claim 6. (Currently amended) A method as claimed in ~~any one of claims 1 to 4~~ claim 3, wherein said EEG is obtained and recorded before it is processed.

Claim 7. (Original) A method of assessing the state of a mammalian brain including the steps of:

(i) obtaining a first electroencephalogram (EEG) from the brain;

(ii) digitising the EEG to define a digitised EEG data signal;

(iii) segmenting the EEG data signal into time frames of fixed length, y[n];

(iv) approximating each digitised time frame by a first equation:

$$y[n] = -\sum_{k=1}^{8} a_k y[n-k] + \sum_{k=0}^{5} b_k u[n-k]$$

(v) solving the first equation to determine coefficients a_1 to a_8 and b_0 to b_5;

(vi) performing a z-transform on the first equation to obtain a second, z-domain equation:

$$Y(z) = \frac{\sum_{k=0}^{5} b_k z^{-k}}{1 + \sum_{k=1}^{8} a_k z^{-k}} U(z) = \frac{B(z)}{A(z)} U(z)$$

(vii) substituting each of the values of the coefficients into the z-domain equation;

(viii) solving A(z) = 0 for z in the second equation to determine the poles;

(ix) plotting the poles in the complex plane;

(x) repeating steps (iv) to (ix) for each frame in the sample to determine clusters of poles in the complex plane;

(xi) obtaining a second EEG from said brain at a later time;

(xii) repeating steps (ii) to (x) in relation to the second EEG at least once;

(xiii) monitoring the movement of at least some corresponding clusters of poles in the complex plane derived from the first and second EEGs respectively; and

(xiv) assessing the state of the brain by reference to movement of at least some of said clusters of poles as mapped in the complex plane.

Claim 8. (Original) A method as claimed in claim 6 including the step of filtering the EEG to remove noise signals therefrom prior to carrying out step (iii).

Claim 9. (Currently amended) A method as claimed in claim 7~~-or 8~~, wherein said first and second EEG is obtained and recorded before it is processed.

Claim 10. (Currently amended) A method as claimed in claim 7~~-or 8~~, wherein said EEG, or said first and second EEG, is obtained and recorded in its entirety for processing at a later point in time.

Claim 11. (Currently amended) A method as claimed in claim 7~~-or 8~~, wherein said EEG, or said first and second EEG, is each repeatedly obtained over consecutive and constant time intervals.

Claim 12. (Original) A method as claimed in claim 11, wherein a said time interval may overlap with an immediately preceding time interval.

Claim 13. (Currently amended) A method as claimed in~~-any one of claims 3 to 12~~ <u>claim 3</u>, wherein the step of step (x) is repeated continuously to track the motion of the poles from each segment.

Claim 14. (Currently amended) A method as claimed in~~-any one of claims 3 to 6~~ <u>claim 3</u>, wherein the step of step (xi) includes the steps:

(xi)(a) taking the centroid of the poles for each cluster of poles; and

(xi)(b) monitoring and comparing the movement of said centroids.

Claim 15. (Original) A method as claimed in claim 14 including the step of:

(xi)(c) analysing the statistical variability of the poles in said clusters of poles.

Claim 16. (Currently amended) A method as claimed in ~~any one of claims 7 to 12~~ claim 7, wherein the step of step (xiv) includes the steps of:

(xiv)(a) taking the centroid of the poles for each cluster of poles; and

(xiv)(b) monitoring and comparing the movement of said centroids.

Claim 17. (Original) A method as claimed in claim 16 including the step of:

(xiv)(c) analysing the statistical variability of the poles in said clusters of poles.

Claim 18. (Original) A method of assessing the efficacy of a cognitively active pharmaceutical agent including the steps of:

(i) obtaining a first electroencephalogram (EEG) from the brain of a subject;

(ii) digitising the EEG to define a digitised EEG data signal;

(iii) segmenting the EEG data signal into time frames of fixed length, y[n];

(iv) approximating each digitised time frame by a first equation:

$$y[n] = -\sum_{k=1}^{8} a_k y[n-k] + \sum_{k=0}^{5} b_k u[n-k]$$

(v) solving the first equation to determine coefficients a_1 to a_8 and b_0 to b_5;

(vi) performing a z-transform on the first equation to obtain a second, z-domain equation:

$$Y(z) = \frac{\sum_{k=0}^{5} b_k z^{-k}}{1 + \sum_{k=1}^{8} a_k z^{-k}} U(z) = \frac{B(z)}{A(z)} U(z)$$

(vii) substituting each of the values of the coefficients into the z-domain equation;

(viii) solving A(z) = 0 for z in the second equation to determine the poles;

(ix) plotting the poles in the complex plane;

(x) repeating steps (iv) to (ix) for each frame in the sample to determine clusters of poles in the complex plane;

(xi) administering a dose of a cognitively active pharmaceutical agent to the subject;

(xii) obtaining a second EEG from said brain after step (xi);

(xiii) repeating steps (ii) to (x) in relation to the second EEG at least once;

(xiv) monitoring the movement of at least some corresponding clusters of poles in the complex plane derived from the first and second EEGs respectively; and

(xv) assessing the efficacy of the cognitively active pharmaceutical agent by reference to movement of at least some of said clusters of poles as mapped in the complex plane.

Claim 19. (Original) A method of assessing the state of vigilance or alertness of a subject including the steps of:

(i) obtaining an electroencephalogram (EEG) from the brain of a subject;

(ii) digitising the EEG to define a digitised EEG data signal;

(iii) segmenting the EEG data signal into time frames of fixed length, y[n];

(iv) approximating each digitised time frame by a first equation:

$$y[n] = -\sum_{k=1}^{8} a_k y[n-k] + \sum_{k=0}^{5} b_k u[n-k]$$

(v) solving the first equation to determine coefficients a_1 to a_8 and b_0 to b_5;

(vi) performing a z-transform on the first equation to obtain a second, z-domain equation:

$$Y(z) = \frac{\sum_{k=0}^{5} b_k z^{-k}}{1 + \sum_{k=1}^{8} a_k z^{-k}} U(z) = \frac{B(z)}{A(z)} U(z)$$

(vii) substituting each of the values of the coefficients into the z-domain equation;

(viii) solving A(z) = 0 for z in the second equation to determine the poles;

(ix) plotting the poles in the complex plane;

(x) repeating steps (iv) to (ix) for each frame in the sample to determine clusters of poles in the complex plane;

(xi) repeating steps (i) to (x);

(xii) monitoring movement of at least some of said clusters of poles in the complex plane; and

(xiii) assessing the state of vigilance or alertness of the subject by reference to movement of at least some of said clusters of poles as mapped in the complex plane.

Claim 20. (Original) A method of assessing the state of sleep of a subject including the steps of:

(i) obtaining an electroencephalogram (EEG) from the brain of a subject;

(ii) digitising the EEG to define a digitised EEG data signal;

(iii) segmenting the EEG data signal into time frames of fixed length, y[n];

(iv) approximating each digitised time frame by a first equation:

$$y[n] = -\sum_{k=1}^{8} a_k y[n-k] + \sum_{k=0}^{5} b_k u[n-k]$$

(v) solving the first equation to determine coefficients a_1 to a_8 and b_0 to b_5;

(vi) performing a z-transform on the first equation to obtain a second, z-domain equation:

$$Y(z) = \frac{\sum_{k=0}^{5} b_k z^{-k}}{1 + \sum_{k=1}^{8} a_k z^{-k}} U(z) = \frac{B(z)}{A(z)} U(z)$$

(vii) substituting each of the values of the coefficients into the z-domain equation;

(viii) solving A(z) = 0 for z in the second equation to determine the poles;

(ix) plotting the poles in the complex plane;

(x) repeating steps (iv) to (ix) for each frame in the sample to determine clusters of poles in the complex plane;

(xi) repeating steps (i) to (x);

(xii) monitoring movement of at least some of said clusters of poles in the complex plane; and

(xiii) assessing the state of sleep of the subject by reference to movement of at least some of said clusters of poles as mapped in the complex plane.

Claim 21. (Original) A method of assessing the state of anaesthesia of a subject including the steps of:

(i) obtaining an electroencephalogram (EEG) from the brain of a subject while anaesthetised;

(ii) digitising the EEG to define a digitised EEG data signal;

(iii) segmenting the EEG data signal into time frames of fixed length, y[n];

(iv) approximating each digitised time frame by a first equation:

$$y[n] = -\sum_{k=1}^{8} a_k y[n-k] + \sum_{k=0}^{5} b_k u[n-k]$$

(v) solving the first equation to determine coefficients a_1 to a_8 and b_0 to b_5;

(vi) performing a z-transform on the first equation to obtain a second, z-domain equation:

$$Y(z) = \frac{\sum_{k=0}^{5} b_k z^{-k}}{1 + \sum_{k=1}^{8} a_k z^{-k}} U(z) = \frac{B(z)}{A(z)} U(z)$$

(vii) substituting each of the values of the coefficients into the z-domain equation;

(viii) solving A(z) = 0 for z in the second equation to determine the poles;

(ix) plotting the poles in the complex plane;

(x) repeating steps (iv) to (ix) for each frame in the sample to determine clusters of poles in the complex plane;

(xi) repeating steps (i) to (x);

(xii) monitoring movement of at least some of said clusters of poles in the complex plane; and

(xiii) assessing the state of anaesthesia of the subject by reference to movement of at least some of said clusters of poles as mapped in the complex plane.

Claim 22. (Original) A method of assessing the state of anaesthesia of a subject including the steps of:

(i) obtaining a first electroencephalogram (EEG) from the brain;

(ii) digitising the EEG to define a digitised EEG data signal;

(iii) segmenting the EEG data signal into time frames of fixed length, y[n];

(iv) approximating each digitised time frame by a first equation:

$$y[n] = -\sum_{k=1}^{8} a_k y[n-k] + \sum_{k=0}^{5} b_k u[n-k]$$

(v) solving the first equation to determine coefficients a_1 to a_8 and b_0 to b_5;

(vi) performing a z-transform on the first equation to obtain a second, z-domain equation:

$$Y(z) = \frac{\sum_{k=0}^{5} b_k z^{-k}}{1 + \sum_{k=1}^{8} a_k z^{-k}} U(z) = \frac{B(z)}{A(z)} U(z)$$

(vii) substituting each of the values of the coefficients into the z-domain equation;

(viii) solving A(z) = 0 for z in the second equation to determine the poles;

(ix) plotting the poles in the complex plane;

(x) repeating steps (iv) to (ix) for each frame in the sample to determine clusters of poles in the complex plane;

(xi) administering the anaesthetic to the patient;

(xii) obtaining a second EEG from said brain after step (xi);

(xiii) repeating steps (ii) to (x) in relation to the second EEG at least once;

(xiv) monitoring the movement of at least some corresponding clusters of poles in the complex plane derived from the first and second EEGs respectively; and

(xv) assessing the state of anaesthesia of the subject by reference to movement of at least some of said clusters of poles as mapped in the complex plane.

Claim 23. (Original) A system having means for assessing brain state by analysing mammalian brain electroencephalographic recordings using an eighth order autoregressive and fifth order moving average discrete time model equation.

Claim 24. (Currently amended) A system having means for performing the method as claimed in ~~any one of claims 1 to 22~~ claim 1.

Claim 25. (Original) Apparatus for assessing brain state of a subject, the apparatus including a plurality of electrodes for picking up EEG signals from the brain of the subject;

digitising means for converting the EEG signals to a digitised EEG data signal;

computing means for:

(i) segmenting the EEG data signal into time frames of fixed length, y[n];

(ii) approximating each digitised time frame by a first equation:

$$y[n] = -\sum_{k=1}^{8} a_k y[n-k] + \sum_{k=0}^{5} b_k u[n-k]$$

(iii) solving the first equation to determine coefficients a_1 to a_8 and b_0 to b_5;

(iv) performing a z-transform on the first equation to obtain a second, z-domain equation:

$$Y(z) = \frac{\sum_{k=0}^{5} b_k z^{-k}}{1 + \sum_{k=1}^{8} a_k z^{-k}} U(z) = \frac{B(z)}{A(z)} U(z)$$

(v) substituting each of the values of the coefficients into the z-domain equation;

(vi) solving A(z) = 0 for z in the second equation to determine the poles;

(vii) plotting the poles in the complex plane; and

display means for displaying the poles, to thereby enable assessment of the brain state of the subject by reference to the position and distribution of clusters of said poles.

Claim 26. (Currently amended) A computer readable medium having computer program instructions stored thereon which, when executed by a computer, performs the steps in the methods as claimed in ~~any one of claims 3 to 22~~ claim 3.